

## Claims

635 What is claimed is:

1. A method for collecting global or population characteristics for decision tree regulation comprises the following steps:
  - (a) Input a decision tree;
  - 640 (b) Input a set of training samples;
  - (c) Use the training samples to determine a decision characteristic for at least one decision tree node, said decision characteristic selected from the group consisting of global characteristics and population characteristics.
- 645 2. The method of claim 1 wherein the decision characteristic compensates for unequal class prevalence in the training samples.
3. The method of claim 1 wherein the decision characteristic compensates for errors in the training data.
- 650 4. The method of claim 1 wherein the global characteristics include global counts.
5. The method of claim 1 wherein the global characteristics include global population statistic.
- 655 6. The method of claim 1 wherein the population characteristics include local population statistic.
7. A method for classification regulation by information integration comprises the
  - 660 following steps:
    - (a) Input a decision tree;

- 25/27 -

- (b) Input a plurality of decision characteristics selected from the group consisting of global characteristics and population characteristics from at least one terminal node of the decision tree;
- 665 (c) Determine the confidence value for each of the plurality of said decision characteristics
- (d) Determine an integrated confidence value for each class of said at least one terminal node.
- 670 8. For a crisp tree application, the method of claim 7 further assigns the class with the maximum integrated confidence value as the decision for the terminal node.
- 9. For a smooth tree application the method of claim 7 further uses the integrated confidence value as the likelihood value.
- 675 10. The method of claim 7 wherein the global characteristics and population characteristics are selected from the group consisting of global counts, local counts, global population statistic, and local population statistic.
- 680 11. The method of claim 7 wherein the confidence value is selected from the set consisting of local count confidence, local population confidence, global count confidence and global population confidence.
- 12. The method of claim 7 wherein the integrated confidence value is a weighted combination of a plurality of confidence values.
- 685 13. The method of claim 7 wherein the global characteristics have a global context coverage that is adjusted using different layer depths.
- 690 14. The method of claim 7 wherein the global characteristics have a global context coverage that is adjusted on a minimum number of training samples.

- 26/27 -

15. A method for tree pruning regulation by information integration comprises the following steps:

- 695 (a) Input a decision tree;
- (b) Input a set of training samples;
- (c) Generate a regulated measure selected from the group consisting of integrated confidence values and reliability measures;
- 700 (d) For a non-terminal node of the tree having two descending terminal nodes, determine the accuracy values using the regulated measure under two separate nodes or combined node conditions;
- (e) If combined node accuracy value is greater than the two separate node accuracy value, prune the terminal nodes by combining the two terminal nodes and convert the associated non-terminal nodes into one terminal node.

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16. The method of claim 15 wherein the reliability measures include a local population reliability measure.

17. The method of claim 15 wherein the reliability measures include a count reliability measure.

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18. The method of claim 15 wherein the reliability measures include a population reliability measure.

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19. The method of claim 15 wherein the reliability measures include a combined reliability measure.

20. The method of claim 15 wherein the reliability measures include a global population reliability measure.

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21. The method of claim 15 wherein the reliability measures include a combined reliability measure.

- 725 22. The method of claim 15 wherein the reliability measure for the maximum class is integrated with the classification accuracy as the criteria for tree pruning
23. A method for tree generation regulation by information integration comprises the following steps
- 730 (a) Input a set of training samples;
- (b) For at least one node, generate a set of candidate thresholds;
- (c) Partition data at a candidate threshold;
- (d) Calculate an evaluation function selected from the set consisting of integrated confidence value and reliability measures;
- 735 (e) Select the partition for the node as the one that maximizes the evaluation function.